AGRICULTURE

Success Story

Stalk and Root Embedding Plow

Benefits

- Reduces air emissions, especially dust; qualifies for a 25% pollution control tax credit in Arizona
- Saves 70% of the energy required for conventional tillage
- Through 2000, has cumulative energy savings of over 31 billion Btu of diesel fuel
- Helps control pests by burying crop residue
- Has saved $170,000 in diesel fuel through 2000
- Increases productivity by reducing trips over the field and requiring 75% to 80% less time to dispose of crop residue and prepare a new seedbed compared with conventional tillage practices
- Is simple and reliable, only requiring draft power to operate; all moving parts turn with the soil as the machine is pulled
- Has avoided 2,350 tons of CO_2 emissions through 2000

Applications

Breakthrough tillage technology for agriculture, including cotton, corn, and other row crops.

"Assistance from DOE was essential in getting the invention through a very challenging development process. DOE also taught me most of what I know about product development."

– Gary Thacker
Principal Inventor of the Rome-Pegasus plow

New Stalk and Root Embedding Plow Prevents Pest Damage and Saves Energy, Cost, and Time in Preparing Fields

Disposing of cotton stalks and roots in the field after harvest is an energy-intensive operation. Nationwide, 78% of cotton farmers use conventional tillage practices that involve shredding the stalks and making several tillage passes over the field to prepare a new seedbed. These tillage operations consume over one-half of farmers' annual fuel budget, and most farmers are frustrated with the high cost and time requirements. Over the last 50 years, farmers have tried several alternative tillage systems, all of which involve uprooting the cotton plants and mixing the crop residue into the soil. All uprooters have shortcomings, and none have gained wide acceptance across the Cotton Belt.

The Rome-Pegasus Plow

Technology Description

The University of Arizona invented the Pegasus plow – a stalk and root embedding tillage machine for burying row crops, especially cotton, to dispose of crop residue and prepare fields for the next crop. The machine is a breakthrough in cotton tillage. It deeply entrenches whole stalks and roots into the soil in one pass, eliminating the need to shred stalks. A narrow moldboard plow opens a deep trench in the soil next to the crop row. Then a "stuffer disk" inserts the roots and stalks into the deep trench. The whole stalks are buried in a "rope" bundle under the bed, where they decompose. The machine also forms new beds, leaving the field ready for the next crop. The Pegasus Machinery Company was started to commercialize the invention and did so with assistance from DOE's Inventions and Innovation Program.

Energy Savings and Pollution Prevention

Rigorous research by the U.S. Department of Agriculture indicates dramatic savings in cost, time, and energy without any adverse effects to crop production. Yields with the Pegasus plow have ranged from the same as conventional methods to 12% greater than conventional methods. The new technology plows 7 acres/hour at 4.0 to 4.5 mph and saves an average of 2.18 gallons of diesel per acre compared with conventional tillage equipment. Cumulative energy savings through the year 2000 have surpassed 31 billion Btu. The associated reduction in CO_2 emissions is estimated to be 2,350 tons and avoided energy purchases total $170,000. The Pegasus plow also greatly reduces air emissions due to the rapid plow-down design. It qualifies for a 25% pollution control tax credit in Arizona.

Economic Success and Market Potential

In 1999, the Rome Plow Company acquired all assets of the Pegasus Machinery Company and exclusive license of the Pegasus plow patent. Now Rome sells the technology as the Rome-Pegasus plow. In 2000 more than 26 plows were sold, more than doubling sales since 1996. To date, 49 units have been sold.

In July 2001, the American Society of Agriculture Engineers awarded the Rome-Pegasus plow with the prestigious AE50 Award. Rome Plow is now planning to target the invention for corn and other row crops, in addition to cotton.

Industry of the Future — Agriculture

Agriculture, a target industry for the Industry of the Future initiative, emphasizes partnerships to develop technologies for using plants, crops, and their wastes as starting materials for industrial products. An agriculture industry team has been formed within the Office of Industrial Technologies (OIT) to facilitate agriculture industry/federal government partnerships. This team will leverage resources available to established OIT teams, such as the chemicals and forest products teams, to strengthen the contributions of the agriculture team and to bring new ideas to the service of the agriculture industry.

OIT Agriculture Industry Team Leader: Mark Paster (202) 586-2821.

The Inventions and Innovation Program works with inventors of energy-related technologies to establish technical performance and to conduct early development. Ideas that have significant energy-savings impact and market potential are chosen for financial assistance through a competitive solicitation process. Technical guidance and commercialization support are also extended to successful applicants.

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